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AUTHOR Van Zoest, Laura R.
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ABSTRACT

Early field experiences are considered a key component of teacher education programs by educators, students, and state boards of education. This study sought to understand better the effects of early field experiences on preservice secondary teachers (n=3) by investigating the focus of their observations of classroom mathematics instruction. The students were enrolled in courses towards the beginning of their teacher education program, prior to any subject-specific methods course. The time spent in this study was credited towards the observational clock-hours required by their courses and certification program. Each preservice teacher observed two secondary school mathematics classes. Each participant was interviewed for about 55 minutes on what she or he had noticed while observing. Field notes were made of the observations and transcripts of tape-recorded interviews provided the primary data source for the study. Discussion of results follow in decreasing order of the time and attention that the preservice teachers allotted to them: classroom management strategies, instructional strategies, teaching style, student behaviors, and mathematics content. Why the preservice teachers focused the least on mathematics in a mathematics classroom is a question worthy of further exploration. Contains 10 references. (MKR)

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THE FOCUS OF PRESERVICE SECONDARY MATHEMATICS TEACHERS' OBSERVATIONS OF CLASSROOM MATHEMATICS INSTRUCTION

Laura R. Van Zoest

Department of Mathematics
Western Michigan University
Kalamazoo, MI 49008
(616) 387-4527
laura.vanzoest@wmich.edu

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THE FOCUS OF PRESERVICE SECONDARY MATHEMATICS TEACHERS' OBSERVATIONS OF CLASSROOM MATHEMATICS INSTRUCTION

Laura R. Van Zoest
Western Michigan University

Early field experiences are considered a key component of teacher education programs by educators (Guyton & McIntyre, 1990), students (Feiman-Nemser & Buchmann, 1985) and state boards of education (Zeichner, 1981-82). Although all parties seem to agree on the importance of early field experiences, it is not clear that they all value these experiences for the same reasons. Students like field experiences because they give them "practical experience" (Feiman-Nemser & Buchmann, 1985) while educators see them as an opportunity to integrate theory and practice (Ball, 1990a). State boards of education mandate minimum numbers of clock or credit hours to be spent in a classroom without addressing the precise nature or quality of the experience (Zeichner, 1981-82).

The implied assumption is that any time spent in a classroom has a positive affect on preservice teachers' future teaching performance. This assumption ignores what Feiman-Nemser and Buchmánn (1985) have referred to as "pitfalls of experience." Three pitfalls that they identify are: a) the familiarity pitfall - preservice teachers gain confidence that they can teach because they are familiar with what goes on in a classroom, b) the two-worlds pitfall - activities that bring success in university coursework may not translate directly into successful teaching, and c) the cross-purposes pitfall - behaviors that lead to success in field experiences (such as accepting uncritically a cooperating teacher's style) may impede future teaching success (Feiman-Nemser & Buchmann, 1985).

Specific actions that can be taken to avoid these and other related pitfalls of experience have not been clearly delineated. The research base for informing early field experiences consists mostly of descriptions of program intentions and lacks assessment of implemented practice and consequences (Guyton & McIntyre, 1990). When detailed research has been completed, the results suggest that early field experiences are most successful at maintaining the status quo (e.g. Evans, 1986; Goodman, 1985).

Based on a collection of ten case studies of elementary preservice teachers, Goodman (1985) concluded that most students' field experiences could be best described by an apprenticeship model. The preservice teachers tended to accept the practices of their cooperating teachers and pattern their subsequent actions after them. She attributes this in part to lack of opportunity for the students to reflect upon their experiences (Goodman, 1985).

In a study of three preservice elementary teachers, Evans (1986) concluded that although the potential for early field experiences was great, for the most part the education students' learning was not maximized because they were unable to think about and reflect on their observations. The preservice teachers in this study focused on external techniques without considering corresponding rationales. This led to "uncritical adoption of what seems to work"

(Evans, 1986, p. 45). When asked what they had noticed while observing, these preservice teachers mentioned personal characteristics and attributes of the classroom teacher as well as the pupils' attitudes towards the class. They noted teaching acts that they felt they could adopt in a future classroom and criticized actions that went counter to their own beliefs about teaching and learning (Evans, 1986).

It appears that preservice teachers have strongly held beliefs about mathematics teaching and learning when they enter their teacher education programs (Ball, 1990b; Civil, 1990). In a study that included secondary as well as elementary preservice teachers, Ball (1990b) found that these students assumed that "doing mathematics means following set procedures step-by-step to arrive at answers; knowing mathematics means knowing 'how to do it'; and mathematics is a largely arbitrary collection of facts and rules" (p. 462). Civil (1990), in her study of four preservice elementary school teachers, came to similar conclusions. She found that the students felt that they weren't "doing mathematics" unless they were writing down formulas and following rules to reach a numerical answer. These students also perceived a difference between "real-world" and "school" mathematics problems and were not alarmed if their answers to "school" mathematics problems would not make sense in the real world (Civil, 1990).

By the time preservice teachers begin early field experiences they have had a minimum of thirteen years of experience as consumers of teaching. Research on preservice elementary school teachers discloses the difficulty of overcoming these years of experience (Ball, 1990a; McDiarmid, 1990). McDiarmid (1990) carefully designed and executed a field experience to challenge preservice teachers' experience-based traditional beliefs about teaching mathematics. Although there was evidence that the preservice teachers in his study had begun to consider what teachers needed to know about learners, subject matter, and pedagogy, there was no confirmation of lasting changes in their beliefs (McDiarmid, 1990). In fact, Ball warns that "experiences may inhibit openmindedness, freeze ways of looking, or engender undesirable attitudes. Experiences can therefore limit our possibilities for continued learning" (Ball, 1990a, p. 11).

As a search of the literature resulted in no in-depth studies of early field experiences at the secondary level, it was not clear whether early field experiences have a similar effect on preservice secondary teachers. The present study sought to better understand the effect of early field experiences on preservice secondary teachers by investigating the focus of their observations of classroom mathematics instruction.

Method

The participants in this study were three volunteer preservice secondary school mathematics teachers. For the purposes of this study they will be referred to as Ellen, Ken, and Ann. These students were enrolled in courses towards the beginning of their teacher education program, prior to any subject-specific methods course. The time spent in this study was credited towards the observational clock-hours required by their courses and certification program.

The researcher accompanied each preservice teacher to observations of two secondary school mathematics classes. Immediately after each session each participant was interviewed for approximately fifty-five minutes about what he or she had noticed while observing. During the interviews the participants were encouraged to "think out loud" about their observations. Questions were asked only when the preservice teachers seemed to have run out of things to talk about.

The interview questions built on the participants' previous comments and were of an open-ended nature to encourage them to reflect further on what they had observed. Examples include "What about her teaching style? Some of the things you've mentioned but can you talk more about that?" and "You mentioned that there was a lack of closure; can you think of anything that could have been done to gain closure?" By the second session the preservice teachers seemed to understand the intent of the interview (to allow them to reflect aloud) and were able to provide a volume of information with very few questions from the interviewer.

Fieldnotes were made of the observations primarily to inform the questioning during the interviews. Transcripts of the tape-recorded interviews provided the primary data source for the study. These transcripts were analyzed using a grounded theory approach to qualitative data as described by Strauss & Corbin (1990).

At the time of this study, the three participants had attained different levels of professional maturity and exhibited varied levels of reflective depth and ability. In spite of this, the aspects of classroom instruction on which they focused overlapped to a remarkable extent. Their differences were both in the quality and quantity of the discussion about their observations and the viability of their suggestions for improvement. In this paper these differences will remain unexplored. Instead the discussion will concentrate on the manifested similarities between the three preservice teachers. The results are presented pictorially in Figure 1 and discussed in the following section.

Insert Figure 1 about here

Results

As the study progressed it became evident that the preservice teachers' observations and suggestions for improvements were filtered through their beliefs about mathematics teaching and learning. Some of these beliefs were in fact contradictory. Two such beliefs, expressed in some form by all three participants, were "The best way to learn mathematics is in a step-by-step discrete manner" and "It is important to relate mathematics to the real world." Unfortunately, not much in the real world proceeds in a step-by-step manner.

The preservice teachers' beliefs, in turn, were affected by their experiences as both students and teachers. These experiences could be vicarious as well as actual. For example, an experience a friend had had as a student could be internalized to the same effect as if it had happened to the preservice teacher him- or herself. The preservice teachers' experiences as teachers included being

an undergraduate teaching assistant, tutoring, and imaging their future, as well as empathy with past and observed teachers.

Within the context of beliefs and previous experiences, the focus of the preservice teachers' observations fell into five main categories. In decreasing order of the time and attention that the preservice teachers allotted to them, these categories were: a) classroom management strategies, b) instructional strategies, c) teaching style, d) student behaviors, and e) mathematics content. A discussion of each of these categories follows.

Classroom management strategies

All participants expressed concern about classroom management strategies. They consistently remarked on strategies that they felt were successful and discussed in depth instances where the teachers lacked classroom control. This concern is reflected and extended in a comment made by Ken regarding classroom management: *"I think that's the biggest fear of teachers - How do I control the kids in my class?"* Ellen also worried about management issues:

> *...what do I do when they all start talking at once? How do I get their attention? Like with a student in the back row - how do I tell if they're paying attention or not? How do I know the difference between someone who is helping another student with math and someone who is just talking about what they did last night?*

After observing a particularly undisciplined class, Ann began the interview by saying:

> *The only thing that stood out to me was that she had no control over her class. ... She was interrupted every time she tried to start something. She spent more time trying to get them quiet than anything else. ... She probably should have taken some kind of disciplinary action rather that just repeatedly telling them to be quiet.*

Ken observed this same teacher during another, less chaotic session but still remarked that

> *I was very unimpressed with the class. I thought it was a very misbehaved class. ... There was a lot of back talk and what I thought was disrespect towards the teacher. I found that to be disturbing. I don't know how you can learn in an environment like that.*

All three students were quick to suggest improvements in class management and frequently drew on their previous experiences. In referring to a particular group of students who seemed to be causing problems, Ken made the following suggestion: *"I think separating them would help a lot. When I went to school you would get split up if you talked; that's the way the teachers kept you from talking during class."* Ann drew on her observations of cause and effect: *"I think it was kind of effective when she started putting the minutes on the board that they were going to stay after class. I noticed that they quieted down real quick."*

The importance of having the students' respect was a reoccurring theme yet none of the preservice teachers seemed to have a concrete grasp of how to gain that respect. In fact, they often suggested apparently contradictory ways of getting that respect. For example, Ellen was struggling with the lack of enforced discipline in a classroom and what it meant to show the

students respect. Her following comments were based in part on an earlier conversation she had had with the observed teacher:

> *...sometimes I wish she would be a little harder on them than what she is. But its very difficult because you have to keep their respect. I was talking to her earlier and she said that if you show them respect then they'll show you respect and I agree with that. But you also have to remember sometimes that you are the authority and you gotta stand your ground. Not that she doesn't do that; it's just sometimes that maybe more should be done.*

Ken also wrestled with whether respect is mandated or evolves. During the first interview he attributed the problems with classroom management to a failure of the teacher to set the rules and stick with them. Then, when he was trying to explain the successful management of the second class he observed, he argued that the respectful atmosphere had evolved and that it was *"not a product of the teacher saying this is the ways it's going to be, period."* He resolved the contradiction by putting the focus back on the students:

> *Theoretically, you know, you are going to come in as a teacher and you're going to teach your students and they're going to sit there and interact and ask questions and be responsive. Well, it hardly ever happens that way. This class is the exception, I would say. Classes like that are teachers' dreams because they're very, very, very well situated to learning and that's what the whole idea is. Classes where you sit around always having to tell students 'Shh! Be quiet, you sit down and be quiet,' and stuff like that, it's disruptive. It is difficult to learn, difficult to teach in an environment like that.*

Student involvement was seen by all three participants as an effective classroom management strategy. They commended such involvement when it occurred and recommended areas where it could be increased. Ellen, for example, made the following comment about the teacher she observed: *"She actually got the students involved rather than letting them drift away while she was up at the board working."*

Another strategy that they considered successful was allowing for continuous interaction between the teacher and the students. The observers felt that the students would be less likely to misbehave if they were involved in an interactive lesson. An example of this is Ann's suggestion *"...she could have had the ones that were causing the disruptions, put them up at the board and confront them with the questions so maybe they'll listen, pay attention, so maybe they'll know the answers to the questions next time."*

Classroom management strategies were a key focus of the preservice secondary school teachers' observation of mathematics instruction. They advocated keeping the students occupied at all times and actively involved in the instruction whenever possible. Ways they felt this could be achieved are covered under the next section, instructional strategies.

Instructional strategies

Instructional strategies were the second major focus of the preservice teachers' observations. The instructional strategy most focused on was questioning. This included

questioning of the students by the teacher and questioning of the teacher by the students. Both types of questioning were valued by the preservice teachers. Ellen both praised and criticized the questioning strategies used by the teacher she observed as demonstrated by the following comments:

> *...when someone asked a question she would answer it rather than letting them drift off...she worked with their questions.*
>
> *I really never heard her ask if there were any questions. The students asked questions if they really wanted to but she never specifically asked them if they had any.*
>
> *I didn't see much in the way of higher-order questions.*

Ellen also empathized with the teacher and rationalized her behavior: *"Although since they were just starting out a chapter I don't know if they would have enough background to answer that type of questions."*

When asked if she could think of any times the teacher could have asked a higher-order question, Ellen was quickly able to come up with an example but then qualified it with *"...maybe that would go off in a different direction that she didn't want to happen. Mostly I think it was just a basic introductory lesson and that is why it lacked higher order questions."*

Another strategy that the preservice teachers noticed and valued was providing direction for the lesson. In regard to one teacher he observed, Ken remarked: *"I like the way he kind of introduces them to what they will be doing, 'We will be studying such-and-such.' Which is kind of nice, it gives the students an idea of what is coming, no surprises."* In contrast, Ellen felt that the teacher she observed *"... didn't really state an objective... She didn't really tell them what to expect."*

When asked if the teachers had met their objectives, all three preservice teachers seemed to equate meeting objectives with having time left at the end of the class period. This is demonstrated by the following comments

> Ken: *"... well, he got done early, so he got done everything he wanted to do, I think."*
>
> Ann: *"I think he met all of his objectives because he had so much free time for homework at the end of the class."*
>
> Ellen: *"She kind of seemed like she met her objectives because she didn't seem to feel she ran out of time or anything like that."*

The students also stressed the importance of relating instruction to the real-world. This was presented as an instructional strategy that, by retaining students' interest, could also eliminate some classroom management problems.

Teaching style

Interaction, or lack of interaction, between the teacher and the students was the most frequently mentioned aspect of teaching style. In one interview Ann discussed the teacher's relaxed attitude towards having the students interrupt his lecture with questions: *"The kids felt free to ask questions, the one kid that asked a lot of questions didn't feel embarrassed or anything."*

Ken praised a teacher he observed for realizing that the students were confused and simplifying the problem into something that was familiar to them. Ellen pointed out similar characteristics in her observed teacher: *"I was impressed at how well she interacted with the students. She could relate to them; she's not so stiff that they feel uncomfortable."*

Other teacher characteristics focused on by the preservice teachers included flexibility and adaptability. These were both seen as desirable attributes that the preservice teachers were not sure they possessed. This is demonstrated by Ellen's reaction to the teacher's flexibility in responding to unanticipated lines of questioning by a student: *"If I was up there teaching and someone were to ask me a question I don't know if I would be able to go back to what I was doing as easily."*

Student behaviors

Student behaviors were usually mentioned in conjunction with observations fitting in the previously discussed categories. Most frequently they were in regard to discipline problems and ways to deal with individual's inappropriate behavior. Some of their reflections, however, dealt with what the preservice teachers perceived to be inappropriate actions or lack of action on the part of the teacher. For example, when discussing one student who she felt had untapped potential, Ellen remarked:

> *[the teacher] went over there and talked to some of the students; she talked a lot to those around him. I don't know if she talked to him. I don't know if that makes a difference but maybe a little more attention just to make sure that he's getting what he's supposed to would help.*

and in another situation with the same teacher,

> *I did notice that she concentrates very heavily on Janet, I think her name is, over in the corner. ...I don't know that I've noticed that she misbehaves any more than anybody else. I don't know if she's just in that particular spot where she concentrates her attention to, but it seems like a lot of people around her are doing just as much, you know, not paying attention as she is yet she seems to be the one that always gets in trouble. And I just kind of noticed that every time she says something to her it seems like she's more reluctant to pay attention to what's going on.*

Other comments focused on types of students; those who were paying attention and those who were not, as well as specific actions that the students took in reaction to the teacher. As mentioned earlier, Ken attributed much of the success of a classroom to the attitude and characteristics of the students. The others did this to a lesser extent. Ann felt that the students were at least partially responsible for the unsuccessful lesson that she observed and commented that she would not want to be going on that class' upcoming field trip.

Mathematics content

The mathematics content was one of the least-focused-upon aspects of the classroom instruction. When pressed the students were able to discuss the mathematics content but they were

slow to suggest improvements and in general did not seem to be too concerned with what could be argued to be the key aspect of a mathematics lesson.

All three students seemed to admire instruction that proceeded in a step-by-step manner. For example, Ellen praised the teacher she observed: *"I think the way she teaches the math, it is very easy for them to understand. ... the way she presented it it's not confusing; it's in a step-by-step manner and she doesn't jump around a lot. She has a goal and she works gradually towards that."* Somewhat contradictory to the step-by-step manner, Ellen also stressed that mathematics has an advantage over other subjects because it is hands on. She stated, *"You have to experience things to really understand them; hands-on in a math classroom would probably be a lot more applicable than in other subjects."*

Ann was the only one who was unable to suggest at least some way of augmenting the mathematics content. She did seem to understand that one lesson could have been stronger, but she could not provide specific improvements:

> *There might be a couple of different ways I might have talked about the subject he talked about today. I mean, basically it would have been the same but there are a couple of other things that I would have mentioned. But then he mentioned things that I might not have.*

When specifically asked to, both Ken and Ellen made sound suggestions for increasing student learning of the topics.

Summary

The preservice secondary mathematics teachers in this study focused on classroom management to an extremely high degree, pedagogy to high degree, characteristics of the teacher and students to a lesser degree and mathematics content to a low degree. The preservice teachers' observations and suggestions for improvements were filtered through their sometimes contradictory beliefs about mathematics teaching and learning. These beliefs, in turn, had been affected by the preservice teachers' past experiences as students and teachers.

Discussion & Implications

The difficulty the preservice teachers had in seeing beyond classroom management problems points out the importance of providing positive classroom environments for them to observe. Although it is important for the preservice teachers to view a cross-section of reality, if they do not observe successful and creative ways of dealing with classroom disturbances they are likely to emulate behaviors of their own teachers. A hidden danger in this approach stems from the distorted perception that students have of their teacher's actions. What they perceived their teacher to have done may or may not have been the whole picture. In the worst scenario, what the student perceives to be the reason for successful classroom management may be a by-product or perhaps a distracter.

The key role that the preservice teachers' beliefs and past experiences played in what they observed and the way that they interpreted their observations emphasizes the importance of understanding what preservice teachers bring to their teacher education program. Addressing

pre-existing beliefs and experiences will assist in developing teacher education programs that efficiently and effectively address the needs and misconceptions of their constituents.

Goodman (1985) considered lack of opportunity to reflect to be a factor in limiting the potential of early field experiences. The current study provided the participants with a structured opportunity to reflect. In some sense they were 'forced' to reflect for the 50-60 minutes after each observation. This was roughly the length of the observations themselves. Although increasing preservice teachers' reflections was not the goal of the study, it was a by-product of the methodology. The participants valued this 'forced reflection' as is evidenced by comments generated by the question "Is there anything else you would like to add?" Ken responded:

> *I am realizing, and I am noticing things about the teaching that I would probably otherwise not have paid as much attention to. ... I think what we're doing here should be done more often. ... I'm talking about things that I probably would not normally talk about. Making analogies about the teaching that I never thought about before...*

Ellen reflected upon ways that the experiences she had had through the study could be replicated in the teacher education program:

> *I think doing observations is a very good idea and sometimes I wish that there would be a class where we could talk about observations. Doing an observation maybe once a week and then in a classroom situation talking to other people about what you saw, what you didn't like and so forth.*

Although a variation of Ellen's suggestion is current practice in many methods classes, the discussions tend to occur towards the end of the teacher education program, after many hours of observation have been logged in isolation. In other words, it may be that the discussion is too little, too late. Another difference in current practice is the lack of shared observations. Even though the interviewer did not participate in a discussion with the interviewees, the preservice teachers seemed to appreciate the fact that she had been present during the observation. They were able to say *"like when she yelled at the one student for getting out of his seat"* without interrupting their reflections to explain to the listener the context of the example. It appears that incorporating discussions about shared observations early in the teacher education program would begin the task of addressing the beliefs and experiences that preservice teachers bring to their programs.

The lack of focus on the mathematics taught in the observed classrooms is cause for alarm. When the students were questioned about the mathematics, "What about the mathematics? Did you notice anything about it?" the students seemed caught off guard. Their reaction implied that they had not given much thought to the mathematics and weren't sure why they should have. This separation of teaching from the content being taught is a concept that needs to be addressed by mathematics teacher educators.

Suggestions for Further Research

The current study provides a glimpse into the focus of preservice mathematics teachers observations of classroom mathematics instruction. More research needs to be conducted before

enough information will exist to fully inform the structure and content of this type of early field experience. One direction for this research is the identification of focuses when a series of observations does not contain serious classroom management problems. Even though the current study contained observations of classrooms that were excellently managed, the preservice teachers saw the well-managed classrooms primarily in relief to the poorly managed ones. Perhaps the preservice teachers would focus on other issues if they had not already been predisposed to focus on management.

In this study the researcher provided no direction as to the focus of the observations. It is possible that if the participants were directed to focus on specific aspects of the classroom instruction their observations would be very different. This is particularly important with regard to the mathematics content as well as reform-related issues such as classroom discourse and source of authority. Why the preservice teachers focused the least on mathematics in a mathematics classroom is a question worthy of further exploration.

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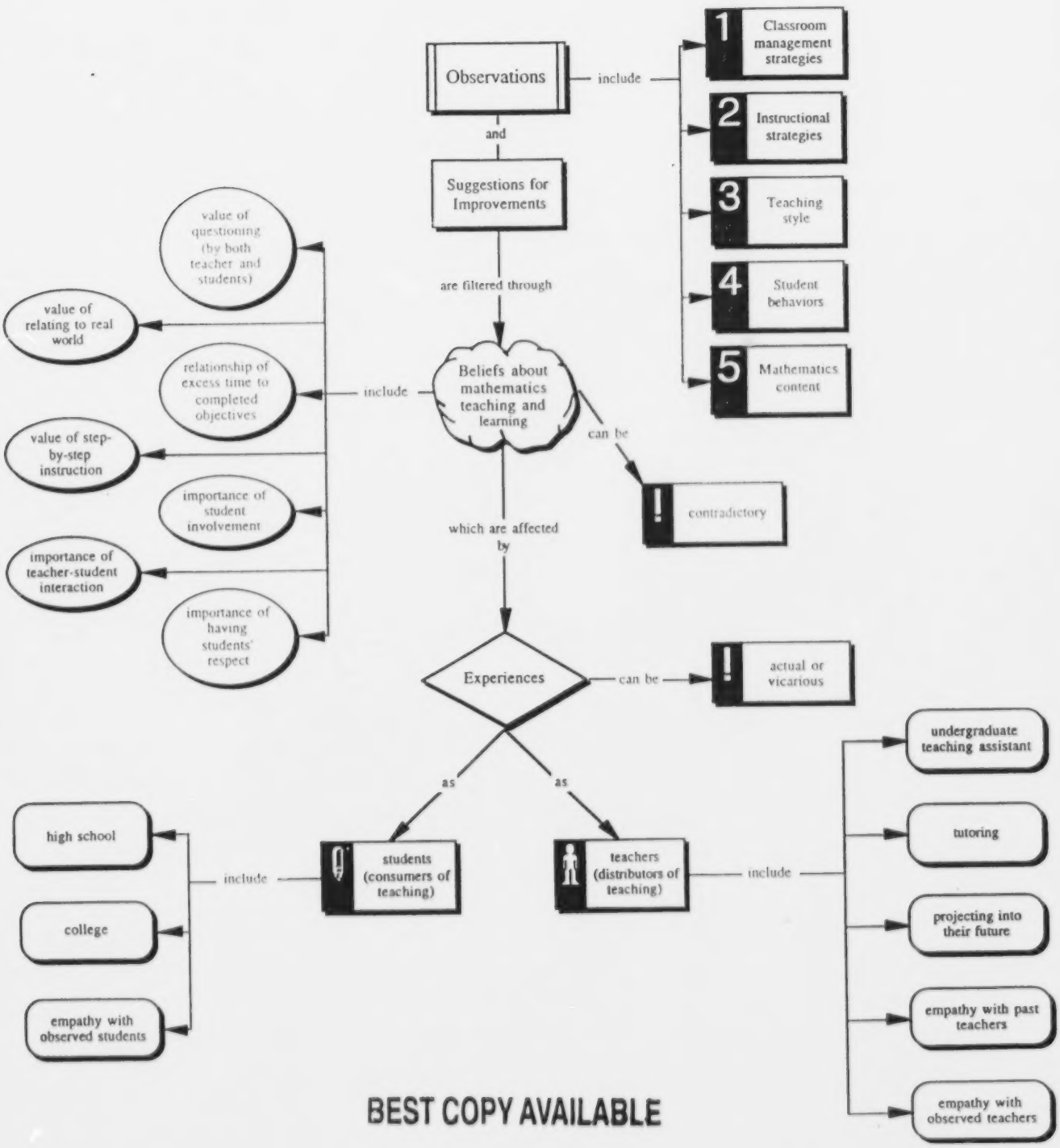
FIGURE

Figure 1. Preservice secondary teachers' observations of mathematics instruction.



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